* NOTICES *

DETAILED DESCRIPTION

[Detailed description]
[0001]
[Field of the Invention] this invention relates to the record regeneration technique for recording or reproducing continuously the music signal and sound signal which were digitized using record regenerative apparatus, such as a magnetic disk and a magneto-optic disk, by the real time.
[0002]
[Prior art] Although the text data was main as processing treated by computer conventionally, data, such as a still picture, an animation, and voice, have been recently treated systematically by progress of software techniques, such as enhancement in I/O techniques, such as a bit mapped display, and AD/DA converter, progress of a high-density mass low-cost record medium, and an object-oriented language, the advanced development of a user interface using the acoustic-sense visual-sense information, the enhancement in computer-processing capacity, etc.
[0003] Unlike a text data, a hour entry must have an important meaning and an animation and voice data must guarantee continuity I/O of real time, in order to change to real time by time series. Although mass buffer memory is needed in order for the medium write-in transfer rate of regeneration equipment, the transfer rate with an external instrument, and the seek time to pose a problem in order to realize a continuity record on real time or continuity regeneration of data, and to solve this, for the reason, technical probrems, like the build up time of voice until voice is actually outputted for example, from output designation becomes late occur.
[0004] Hereafter, the case where voice data is treated with the conventional file system, for example, the file system of UNIX, is explained, referring to a drawing.
[0005] (Drawing 5) is drawing showing the fundamental concept of the data control in the file system of UNIX. Drawing in which (drawing 6) shows a block of the storage of the file of the conventional example, and (drawing 7) are the record regeneration timing charts of the storage of (drawing 6). For 1, as for a buffer and 5, in (drawing 6), the I/O section of data and 4 are [a head and 6] storages. 512 bytes or 1024 bytes are consisted of by two or more fixed-length blocks and the common target, a file system connects the storage location of a block to them logically, and the file which a file system treats has managed it as a file. Since the operation of storage and regeneration is reverse, it explains a regeneration operation. A block is dispersedly arranged in the arbitrary positions on a storage 6, as shown in a basic target at (drawing 5). Usually, data are read into a buffer 4 from a storage 6 by 1 block with a head 5. (Close) It doubles with the transfer rate of the output section 1, and data are transmitted to the output section 1 from a buffer 4 and 4' (close). (Close) It winds to the end of a file in the procedure of reading the following block into a buffer 4 and 4' while having transmitted to the output section, and is **********.
[0006] Unlike a text file, voice data must be continuously outputted without a way piece in time from the beginning of a file to the last. for this reason -- being alike -- although a problem will not be produced if the data transfer rate to the parvus and the output section has the late seek time, it cannot necessarily be satisfied of this condition with common storage, and does not have the FM for solving these problems in the conventional file system
[0007] In order to solve the way piece by seeking, once reading sufficient data to predict the total seek time beforehand and absorb this time to semiconductor memory, the method of transmitting data to the output section is. When this technique deals with the voice of transfer rate about 1.4 Mbpses about a compact disk, the capacity of semiconductor memory becomes large, and audio build up time poses a problem. That is, if the time (seek-time + read-out time) needed for one block of the data memorized by the medium being read excels from the time (a block size / output transfer rate).

when the block is transmitted to the output section, it must store and put all the data of a file on semiconductor memory temporarily. Therefore, the capacity of semiconductor memory becomes the size which is not realistic, or delay will arise from memory to read-out. .

[0008] On the other hand, there is also the another resolution technique. (Drawing 8) is the technique of arranging a block of a file continuously physically on a storage 6. Although the seek time for a file being accessed by this technique requires only the time that seeking to a file head takes, in case the troubles of this technique are that an user needs to be conscious and it is necessary to secure a continuity field and an edit of a file, I understand that the time which edit processing takes becomes long, and they have it. Unless it knows the size of data beforehand, a continuity field will not be securable, when a new file is inserted in a file or a size which is added is changed, it will be necessary to make a file once shunt, and it will be necessary to secure a continuity field. In big shunting of a file size, at least shunting cannot be disregarded on a time target.

[0009]

[Object of the Invention] Thus, although a problem will not be produced if the data transfer rate to the parvus and the output section has the late seek time in order to output voice data continuously without a way piece in time from the beginning of a file to the last unlike a text file, it cannot necessarily be satisfied of this condition with common storage, and does not have the FM for solving these problems in the conventional file system.

[0010] Moreover, although the method of transmitting data to the output section is once reading sufficient data to predict the total seek time beforehand and absorb this time to semiconductor memory in order to solve the way piece by seeking, when dealing with the voice of the transfer rate about a compact disk, memory space becomes large, this technique will require time for read-out from memory, and delay will produce it in a voice output.

[0011] Moreover, in case it is that an user needs to be conscious and it is necessary to secure a continuity field as the another resolution technique although there is the technique of arranging a block of a file continuously physically on a storage, and an edit of a file, the time which edit processing takes becomes long.

[0012] Moreover, in storage of the sound signal using the disk, it had the not clear technical probrem about the technique of recording the signal of many channels.

[0013]

[The means for solving a technical problem] this invention is made in view of the technical probrem of the record regeneration technique of the above-mentioned conventional voice data, especially the record regeneration technique of many channels, and is equipped with the I/O section, the data array section, the time instrumentation section or a data detecting element, the buffer by semiconductor memory, a head, and a storage.

[0014]

[Operation] this invention can memorize data to a storage at high speed, maintaining a continuity by the real time arranging the voice data of many channels dispersedly on a storage, and using a mass semiconductor memory buffer by taking a configuration which was described above, or can offer the record regeneration technique which can be read.

[0015]

[Example] Hereafter, an example is described in detail.

[0016] The block diagram and (drawing 2) which showed the configuration of the equipment which realizes the record regeneration technique [first (drawing 1) in the 1st example of this invention] are the record regeneration timing chart of the data in the equipment of (drawing 1). For the data array section and 3, in (drawing 1), time instrumentation section or data detecting-element, 4, and 4' of a buffer and 5 is [1 / the I/O section and 2 / a head and 6] storages. The principle of the record regeneration technique in the 1st example of this invention realized with the equipment like (drawing 1) is explained.

[0017] Below, in the case of voice data, it extracts and explains. The relation of the data transfer rate between the storage 6 and the buffer 4 for first guaranteeing continuity I/O on the real time in the case of a discrete-type block file, and 4 'the minimum block size and the buffers 4 and 4' which can carry out Read-Wite by the transfer rate of a between, the seek time of a storage 6, and one access, and the I/O sections 1 is clarified.

[0018] First, an AD converter or the digital data from an external instrument is incorporated from the I/O section 1, and is Writed by turns by the 1st, the 2nd buffer 4, and 4' by the I/O section 1, the buffer 4, and the data transfer rate VO [Byte/s] allowed between 4'. Next, if a head 5 seeks into a target truck and a target sector and finishes seeking, the data of the 1st buffer 4 will be transmitted to a head 5 by data-transfer-rate VS [Byte/s] allowed between a buffer 4 and the storage 6, and will be memorized by the storage 6. In the meantime, the data from the I/O section 1 are Writed by 2nd

previous buffer 4'. If the data of the 1st buffer 4 finish Writing to a storage 1, seeking will be performed continuously, and the data of 2nd buffer 4' are Writed by the storage 1. Henceforth, this operation is repeated the number of need times. It is also possible to transmit and memorize data to a storage 1, without waiting for a buffer 4 to fill apart from this technique, if the data needed are written in a buffer 4. Since the operation of storage and regeneration is reverse, they omit an explanation. Here, while the data for 1 block are once stored in a buffer 4 and this data for 1 block is outputted so that continuity storage or regeneration of data may be guaranteed, the following data for 1 block are stored in a buffer 4. The following relations consist of this.
[0019]
[A-one number]

$$\frac{L_B}{V_S} + T_{SK} \leqq \frac{L_B}{V_B}$$

[0020] In ******, TSK [sec] is the maximum seek time. That is, it seeks, and the continuity of data is maintained if time to read the data of LB [Byte] from a storage and store in a buffer 4 does not exceed the time when the data of LB [Byte] are transmitted between a buffer 4 and the I/O section 1. It will be obtained if (a-one number) is transformed (-two number).
[0021]
[A-two number]

$$L_B \geqq \frac{V_S \times V_B \times T_{SK}}{V_S - V_B}$$

[0022] If this is secured more than the size it is decided by (the-two number) that a block size will be, it can be understood that a continuity is guaranteed.
[0023] (Drawing 3) is drawing having shown the order (format) of a data storage on the storage 6 of the 1st example of this invention, and explains the writing and how to read below using (drawing 1) and (drawing 2).
[0024] At the time of a record, singleness or the digital sound signal of two or more channels is incorporated from the I/O section 1. If the minimum storage unit LB in one access described above [a byte] shall be expressed in relation with LB=rxqxN when arbitrary positive integers and N are made into the number of channels and p and r are made into one sample, q [a byte] The 1st sample of the 1st channel to the Nth channel, the 2nd sample of the 1st channel to the Nth channel, ..., It is alike so that last each channel may become the r-th sample with the basic configuration which consists of a byte's (qxN) N sample in the order of the r-th sample of the 1st channel to the Nth channel and it may become r repeat data arrays of a basic configuration, and it is stood in a line and changed according to a control of the data array section 2. The 1st buffer 4 in a buffer 4 Writes by the data transfer rate VO [Byte/s] allowed between the I/O section 1 and the buffer 4. Next, if a head 5 seeks into a target truck and a target sector and finishes seeking, it will be transmitted to a head 5 from the 1st sample of the 1st channel of the data of the 1st buffer 4 by data-transfer-rate VS [Byte/s] allowed between a buffer 4 and the storage 6 one by one, and a storage 6 will memorize. In the meantime, when the data from the I/O section 1 are Writed by 2nd buffer 4' of the previous buffers and Write is completed, seeking is performed again and the data of 2nd buffer 4' are Writed by the storage 1. Henceforth, this operation is repeated the number of need times. [whether apart from this technique, time until the 1st sample scale division of the Nth channel are written in a buffer 4 by the time instrumentation section or the data detecting element 3 is measured, and] It is detected that the 1st sample scale division of the Nth channel are written in a buffer 4. Without waiting for a buffer 4 to fill, at least, when the 1st sample of the Nth channel is written in a buffer 4 LB [Byte] is read from the 1st sample of the 1st channel of this buffer 4 one by one, and through a head 5, it is transmitted to a storage 6 and memorizes. If all the data of the 1st buffer 4 finish being memorized, the data of 2nd buffer 4' are able to perform seeking again and to be memorized shortly.
[0025] Data are read at the time of regeneration, using the aforementioned minimum regeneration unit LB [a byte] as a unit at least from a storage 6. According to this minimum regeneration unit LB [byte] aforementioned data array, it is

written in the 1st buffer 4 and buffer 4of ** 2nd' at least by turns. [every] When a buffer 4 fills Or the thing for which the 1st sample of the Nth channel was written in the buffer 4 at least If detected by the aforementioned time instrumentation section or the data detecting element 3, a control of the data array section 2 will be followed. The 1st sample of the 1st channel of this buffer 4, the 1st sample of the 2nd channel, The 1st sample of the 3rd channel, ..., the 1st sample of the Nth channel, The 2nd sample of the 1st channel, the 2nd sample of the 2nd channel, the 2nd sample of the 3rd channel, It is read in the order of the r-th sample of the r-th channel and the 3rd channel, ..., the r-th sample of the Nth channel of ..., the r-th sample of the 1st channel, and the 2nd channel, and is transmitted to the I/O section 1.

[0026] The minimum storage or the minimum regeneration block size LB [Byte] for taking a matching of the transfer rate of the I/O section 1, the buffer 4 and the buffer 4, and the storage 6 in this 1st example here, The time TIO when the sector size LS [Byte] by which the storage was standardized, and the block size LB are written in a buffer 4 from the I/O section 1 [Sec], A numerical example typical in order to calculate time TM [Sec] written in a buffer 4 from a storage 6 and the voice build up time TS [Sec] until voice is actually outputted from audio output start designation is raised. Minimum block-size LB, the time required for writing minimum block-size LB data in a buffer 4 from the I/O section 1, the time required for writing minimum block-size LB data in a buffer 4 from a storage 6, and audio build up time are calculated. The following is a transfer rate between sampling Fs=48kHz, and 1 sample = 16 bits (q= 2), the I/O section 1 and the buffer 4. It is referred to as [Byte/S] =96xN(number of channels) K [[Byte/S] maximum access-time TSK[Sec] =45ms between Byte/S], the buffer 4, and the storage 6, and a LS=512[byte]. [VO] [[Byte/

[0027] The example of a calculation of the minimum block size LB is as follows. When it calculates using (a-two number), in two channels, it is. LB= 11K[Byte]

In the case of four channels LB= 29K[Byte]

In the case of eight channels LB=171K[Byte]

The formula of time to write the minimum block size LB in the I/O section 1 from the buffer 4 or the buffer 4 is given by (the-three number) from the I/O section 1, and the example of a calculation is as follows.

[0028]

[A-three number]

$$T_{IO} = \frac{L_B}{V_0} = \frac{L_B}{F_S \times q \times N} = \frac{L_B}{96000 \times N}$$

(48KHzサンプリング、16bit(q=2)の場合)

[0029]

In the case of two channels TIO= 57 [ms]

In the case of four channels TIO= 76 [mS]

In the case of eight channels TIO=223[ms]

The formula of time to write the minimum block size LB in a buffer 4 from the storage 6 or the storage 6 is given by (the-four number) from a buffer 4, and the example of a calculation is as follows.

[0030]

[A-four number]

$$T_H = \frac{L_B}{V_S}$$

[0031]
In the case of two channels TM= 12 [ms]
In the case of four channels TM= 30 [ms]
In the case of eight channels TM=178[ms]
At the time of a record, buffer 4 ******** is transmitted from the I/O section 1 like the 1st example of this invention here. When the 1st sample scale division of the Nth channel are Writed by the buffer 4 If it seeks and seeking is completed, data will be transmitted and memorized from the ** buffer 4 to a storage 6 by Write after Read. at the time of regeneration If seeking is completed, data are transmitted to a buffer 4 from a storage 6 and the 1st sample scale division of the Nth channel are Writed by the buffer 4, when data transfer to the I/O section 1 will be performed from a buffer 4 by ** Write after Read, If the transfer rate V0 to a buffer 4 does not pass data-transfer-rate VS from a storage 6 to a buffer 4 from the I/O section 1, since a breakdown is not produced in Write after Read of the data in a buffer 4 The number of channels which a breakdown does not produce is given by the following (-five numbers).
[0032]
[A-five number]

$$N \leq \frac{VS}{q \times FS}$$

[0033] It will become ten channels if the aforementioned conditions are applied. Next, the example of audio build up time is calculated.
[0034] An important thing is having to move to Read for the first time here, after a part for at least 1 sample of several channel minutes needed is Writed. If this is not performed, in order to maintain a time relation and to reproduce the data of each channel simultaneously, a mass buffer is needed for the I/O section 1. Time until a part for this at least 1 sample of several channel minutes needed is written turns into the build up time of the minimum voice. In this case, how to write the sample of each channel contained in the buffer of ****** also by the same capacity LB influences audio build up time. A formula is given by the following (-six numbers).
[0035]
[A-six number]

$$T_S = T_{SK} + \frac{q \times N}{V_S}$$

[0036] When typical and ** is calculated, in two channels, it is. TS=45[ms]
(q= 2, r= 2750)
In the case of four channels TS=45[ms]
(q= 2, r= 3625)
In the case of eight channels TS=45[ms]
(q= 2, r= 10688)
It becomes, and even when it is the worst, it becomes the maximum seek time mostly.
[0037] (Drawing 4) is drawing having shown how (format) to write the data on the storage 6 of the 2nd example of this invention, learns the writing and how to read from the 1st example, and explains them below.
[0038] At the time of storage, singleness or the digital sound signal of two or more channels is incorporated from the I/O section 1. From the 1st sample to the Mth sample of the 1st channel, from the 1st sample to the Mth sample of the 2nd

channel From the 1st sample to the Mth sample from the 1st sample of the 3rd channel, ..., the Mth sample of the Nth channel From a ** (Mx(p-1) +1) sample to ... and the ** (pxM) sample of the 1st channel From ** (Mx(p-1) +1) to ** (pxM) of the 2nd channel, from a ** (Mx(p-1) +1) sample to the ** (pxM) sample of the 3rd channel According to a control of the data array section 2, it is stood in a line and changed so that it may become the data array of p basic configurations of ... and a ** (Mx(p-1) +1) sample to the ** (pxM) sample of the Nth channel. The future storage operation and the regeneration operation are the same as that of the 1st example. The build up time of the voice in this 2nd example is given by the following (-seven numbers).
[0039]
[A-seven number]

$$T_S = T_{SK} + \frac{\frac{L_B}{p} \times \left(\frac{N-1}{N}\right) + q}{V_S}$$

[0040] When the case of being typical is calculated on the same conditions as the 1st example, in two channels, it is. TS= 51 [ms]
(q= 2, M= 2750, p= 1)
In the case of four channels TS= 68 [ms]
(q= 2, M= 3625, p= 1)
In the case of eight channels TS=2001[ms]
(q= 2, M= 10688, p= 1)
It becomes.
[0041] Here, if it takes in the sector size Ls [a byte] which is having the group of the sample of each channel of the 2nd example standardized, the build up time of the voice at this time will be given by the following (-eight numbers).
[0042]
[A-eight number]

$$T_S = T_{SK} + \frac{L_S \times (N-1) + q}{V_S}$$

[0043] In this case, the conditions of p= 1 are a case which is in a typical case although removed where it is two channels when it calculates. TS=46[ms]
(q= 2, M= 256, p= 11)
In the case of four channels TS=47[ms]
(q= 2, M= 256, p= 15)
In the case of eight channels TS=49[ms]
(q= 2, M= 256, p= 42)
It becomes.
[0044] In the 1st and the 2nd example, at the time of a data storage, as for Write of the data to a buffer 4, and Read, the time of regeneration may perform a change of a buffer, and a data transfer, after all the data of the above mentioned minimum storage or the above mentioned minimum regeneration unit LB are written in. In this case, although the change of a buffer is easy, audio build up time becomes late.
[0045] Moreover, in the 2nd example, (a-eight number) corresponds, when large p is taken, and when there are many channels, the audio standup has become early as a result. When adopting new disk formatting using a magneto-optic disk etc., it is important into how much this p is made.
[0046] Since there is that it is more convenient to carry out grouping of the data to deal with for every channel although a

performance becomes high at the order of the example of sector size adoption of the 1st example and the 2nd example and the 2nd example, considering the earliness of audio build up time from the above example, the 2nd example example is more effective than the 1st example from the point.

[0047] Like this invention, attachment of data on each truck which was conscious of each truck at the time of regeneration or the simultaneous regeneration timing of a channel unlike the store method using the conventional tape recorder, i.e., storage, is unnecessary in the technique of recording data dispersedly using a disk. It is because unlike the thing which cannot slip namely, time offset the time-axis of each truck independently like a tape the hour entry called time code for every data of each channel can also be memorized and this information can also be easily corrected by the disk later. Therefore, what is necessary is for the time relation of each channel to ignore and just to memorize it anyhow, in memorizing through data. Therefore, he does not need to be conscious of the timing which actually memorizes the function to memorize the data simultaneously on another truck while reproducing a certain truck called the exaggerated dub or ping-pong currently performed by the tape medium conventionally, the function to double with it and to memorize another data from the I/O section while reproducing a certain truck called bounce, etc., on a disk, and the location.

[0048]

[Effect of the invention] As mentioned above, a magnetic disk or a magneto-optic disk is used for this invention. When voice data is recorded and it reproduces, in order to once store in a buffer, to make the transfer rate between a buffer, between the I/O sections and a medium, and a buffer match and to carry out regeneration processing of the data continuously securing the data size more than the minimum record determined from the seek time to the purpose truck, and the relation with the above-mentioned transfer rate, or the minimum regeneration data size When the sample of each channel is written in a buffer from a storage from the I/O section at the time of regeneration at the time of storage and the data of 1 sample scale division of the last channel finish writing in, data by it being made to read for the first time The technique of enabling early and continuity storage or continuity regeneration for the standup of the voice from voice-output designation can be offered. Moreover, if grouping of each channel sample is carried out from a storage for every channel to a buffer at the time of storage, it memorizes at it from the I/O section to the time of regeneration and the 1st sample of the last channel finishes writing in similarly, securing the minimum record or the minimum regeneration data size, the technique of enabling continuity storage or continuity regeneration can be offered by reading data for the first time. Moreover, similarly, securing the minimum record or the minimum regeneration data size At the time of storage, make into a unit the sector size of the disk standardized from the storage from the I/O section to the time of regeneration, and carry out grouping of the data of each channel, and they are recorded. If one sample of the last channel finishes writing in, by reading data for the first time, the technique of enabling early and continuity storage or regeneration for an audio standup can be offered.

[Translation done.]

CLAIMS

[Claim]
[Claim 1] At the time of a data input, with singleness or the I/O section to which the digital sound signal of two or more channels is inputted or outputted minimum storage-unit LB[which was incorporated from this I/O section and which is indicated below -- the data for byte] When p and r are set into arbitrary positive integers and N is set to q [a byte], the number of channels, and one sample It shall be expressed in relation with LB=rxqxN. The 1st sample of the 1st channel to the Nth channel, With the 2nd sample of the 1st channel to the Nth channel, ..., the basic configuration that consists of a byte's (qxN) N sample in the order of the r-th sample of the 1st channel to the Nth channel It is stood in a line and changed by r times of the repeats of a basic configuration so that each last ******** may become the r-th sample. at the time of data output conversely, minimum regeneration unit LB[indicated from a buffer to the following -- data are located in a line and changed so that the data for byte] become the same as that of the I/O section data array at the time of a data input -- with the data array section controlled to obtain At least two buffer memory sections, the time [to plan time until the 1st sample scale-division data of the Nth channel are written in a buffer] instrumentation section, or the data detecting element that detects having been written in, It has a head and the storage section. the data transfer rate between the I/O section and a buffer VO [a byte/second], VS [a byte/second] and the maximum seek time of a storage TSK [a second], [the data transfer rate between a buffer and a storage] When the minimum storage by one access continuity storage or continuity regeneration of data is guaranteed to be, or the minimum regeneration unit is expressed as LB [a byte] The minimum storage or the minimum regeneration unit LB It is made to satisfy LB>=VSxVOxTSK/(VS-VO). at the time of the writing of the data to a storage The data from the I/O section follow a control of the data array section. The 1st buffer, When it is written in the 2nd buffer at least by turns according to this minimum storage-unit LB [byte] aforementioned data array and a buffer fills, [every] Or at least, when it is detected by the time instrumentation section or the data detecting element that the 1st sample of the Nth channel was written in the buffer It is read from the 1st sample of the 1st channel of this buffer one by one, is sent to a head, and memorizes in the storage section. at the time of regeneration Data are read, using the aforementioned minimum regeneration unit LB [a byte] as a unit at least with a head from the storage section. When it is written in the 1st buffer and the 2nd buffer at least by turns according to this minimum regeneration unit LB [byte] aforementioned data array and a buffer fills, [every] Or at least, when it is detected by the time instrumentation section or the data detecting element that the 1st sample of the Nth channel was written in the buffer A control of the data array section is followed. The 1st sample of the 1st channel of this buffer, The 1st sample of the 2nd channel, the 1st sample of the 3rd channel, ..., The 1st sample of the Nth channel, the 2nd sample of the 1st channel, the 2nd sample of the 2nd channel, The record regeneration technique

characterized by being read in the order of the r-th sample of the r-th channel and the 3rd channel, ..., the r-th sample of the Nth channel of the 2nd sample of the 3rd channel, ..., the r-th sample of the 1st channel, and the 2nd channel, and being transmitted to the I/O section.
[Claim 2] At the time of a data input, with singleness or the I/O section to which the digital sound signal of two or more channels is inputted or outputted minimum storage-unit LB[which was incorporated from this I/O section and which is indicated below -- the data for byte] When p and M are set into arbitrary positive integers and N is set to q [a byte], the number of channels, and one sample It shall be expressed in relation with LB=pxNxM**. From the 1st sample to the Mth sample of the 1st channel From the 1st sample to the Mth sample of the 2nd channel, from the 1st sample to the Mth sample of the 3rd channel ..., the Mth sample from the 1st sample of the Nth channel, ..., From a ** (Mx(p-1) +1) sample to the ** (pxM) sample of the 1st channel From ** (Mx(p-1) +1) to ** (pxM) of the 2nd channel, from a ** (Mx(p-1) +1) sample to the ** (pxM) sample of the 3rd channel It is stood in a line and changed by the repeat of p basic configurations of ... and a ** (Mx(p-1) +1) sample to the ** (pxM) sample of the Nth channel. at the time of data output conversely, minimum regeneration unit LB[indicated from a buffer to the following -- with the data array section controlled so that the data for byte] may become the same as that of the I/O section data array at the time of a data input and data are rearranged At least two buffer memory sections, and the time [when the 1st sample scale-division data of the Nth channel time buffer writing ** rare ******] instrumentation section or the data detecting element which detects having been written in, It has a head and the storage section. the data-transfer rate between the I/O section and a buffer VO [a byte/second], The data-transfer rate between a buffer and a storage VS [a byte/second], Continuity storage or regeneration of TSK [a second] and data is guaranteed for the maximum seek time of a storage. When the minimum storage by one access or the minimum regeneration unit is expressed as LB [a byte] The minimum storage or the regeneration unit LB It is made to satisfy LB>=VSxVOxTSK/(VS-VO). at the time of the writing of the data to a storage the 1st buffer and the 2nd buffer -- alternation -- at least -- this minimum storage-unit LB[, when a part for byte] is written in and a buffer fills Or when it is detected by the time instrumentation section or the data detecting element that the 1st sample of the Nth channel was written in the buffer at least It is read from the 1st sample of the 1st channel of this buffer one by one, is sent to a head, and memorizes in the storage section. at the time of regeneration Data are read, using the aforementioned minimum regeneration unit LB [a byte] as a unit at least with a head from the storage section. the 1st buffer and the 2nd buffer -- alternation -- at least -- this minimum regeneration unit LB[, when a part for byte] is written in and a buffer fills Or at least, when it is detected by the time instrumentation section or the data detecting element that the 1st sample of the Nth channel was written in the buffer The 1st sample of the 1st channel of this buffer, the 1st sample of the 2nd channel, The 1st sample of the 3rd channel, ..., the 1st sample of the Nth channel, The 2nd sample of the 1st channel, the 2nd sample of the 2nd channel, the 2nd sample of the 3rd channel, ..., the 2nd sample of the Nth channel, ..., the ** (pxM) sample of the 1st channel, The record regeneration technique characterized by being read in the order of the ** (pxM) sample of the 2nd channel, the ** (pxM) sample of the 3rd channel, ..., the ** (pxM) sample of the Nth channel, and being transmitted to the I/O section.
[Claim 3] The record regeneration technique of the claim 1 publication characterized by being referred to as LS=qxNxM when the sector size standardized in the medium is made to LS [a byte] and M is made into a positive integer.
[Claim 4] The record regeneration technique of the claim 2 publication characterized by being referred to as LS=qxM when the sector size standardized in the medium is set to LS [a byte].

[Translation done.]